Run II Upgrades Status
September 2005 Report

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Outline

- Technical Progress
  - Highlights for Sep. –Oct. '05
  - Review of FY05 work since OPS review in Mar. 05
  - Outlook for FY06/07
  - Preview of v4 plan
- Status Report for September '05
  - Milestones
  - % Complete
  - M&S Costs
  - Effort Report
- Change requests
- Contingency Analysis

Technical Highlights (1)

- Status of electron cooling in the Recycler
  - e-cool essentially integrated into HEP operations
  - Routine "Recycler only" stores
    - Up to 285E10 pbars stored in the machine
    - ~250E10 max transferred to Tevatron store
  - Cooling utilizes electron beam ~200mA
    - 670 mA for 30 minutes
  - Studying instabilities on over-cooling
    - Testing techniques for preventing the on-set of instabilities
    - Testing medium-band damper
    - Will review to proceed with broad-band damper
- Rapid Transfers
  - Accumulator to Recycler
    - AP1 ramping PS upgrade –in progress
    - AP1,AP3 beamline BPM upgrades done; P1,P2 to follow
    - Hall probes
    - Injection dampers in MI

Technical Highlights (2)

- MI BPM electronics design review
  - Conducted Oct. 12, '05
  - Recommendation was to go ahead with procurement of parts
  - Project piggy-backs on Tev BPM project; many systems copied

- Pbar situation
  - Dave's talk
  - Target
    - Had switched to Inconel-600 from stainless steel because of longevity issue, even though SS was declared the best target with regards to yield
    - New target/target motion/target cooling design being worked on
    - Beam sweeping to be re-visited
  - Internal report being prepared on target, Li lens, pulsed magnet status and plans.

Scope of Work (DOE OPS review March '05)

- FY05
  - Continue optimizing slip-stacking (Operations) √
  - Complete Tev BPM project √
  - Commission 2.5 MHz pbar acceleration
    - Ready to implement for pbars from recycler
    - Suffers from lack of study time and support
    - Can save 10-15% pbars in each Tevatron shot
  - Continue improving pbar acceptance & stack rate
    - Work continues
    - What will we have? 20+, 30+ mA/hr ??
  - Improve diagnostics in AP2/DB/D→A √ continue
  - Commission electron cooling √
  - Continue helix/separators R&D √
  - Prepare TEL2, IPM and OTR for installation √
    - IPM, OTR will be ready
    - TEL2 status review in November

Scope of Work (DOE OPS review March '05)

- FY06
  - Make electron cooling operational √
  - Implement stacktail upgrades (in two steps)
    - Tank move as soon as stack rate/flux requires it
    - Decide on bandwidth upgrade in summer '06
  - Continue to improve antiproton acceptance
  - Commission TEL2 into operations
  - Complete MI BPM project (on track)
  - Complete BLM project (on track)
- FY07
  - Complete antiproton acceptance improvements
  - Complete helix improvements

V3→v4 Scope Change :

Install & commission full bandwidth upgrade in '07 shutdown (v3 had it in '06)

Project Plan Version 4

- Will have a version 4 plan in Nov. –Dec. with revised scope for some projects
- Delay in shutdown (originally scheduled to start Aug. 8, '05) impacts many projects
- Will re-baseline with new shutdown dates and new scope for v4.0 by Dec. 1

Preview of Version 4

- Redefining Operational Phases
- V3:
  - Phase 2: After slip-stacking ← current phase
  - Phase 3 ≡ e-cool for HEP + tank move
  - Phase 4 ≡ bandwidth upgrade +helix
- Proposal for V4:
  - Phase 3 ≡ Integration of e-cool for HEP
    - to commence on Nov. 1 ?
  - Phase 4 : First phase of stacktail upgrade
    - tank move when we reach stack rates that would require it
  - Defer work on Stacktail bandwidth upgrade
    - Decision milestone in summer '06 (mid-July '06)
      - back from shutdown in June
  - Phase 5: bandwidth upgrade and/or remaining aperture +Tev upgrades

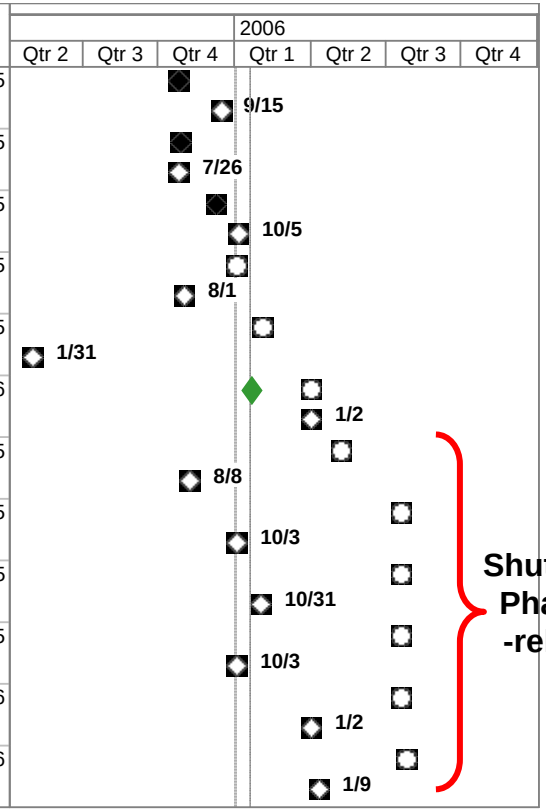
Other items for Version 4

- Separators done
  - All R&D wrapped up except Ti electrode but no plans for using in operation
  - Get the spares ready, transfer to Tev Department and close out
- Review TEL2 status and beam-beam simulation/studies
  - Likely to cancel TEL3

September Status

Milestones

WBS	Name	MS Class	Finish	Base Fin
1.1.3.2.1.2	MI BPM: Review (Milestone)	C	7/25/05	9/15/05
1.3.5.6.3.5	Obtain 500 MA DC Beam (Milestone)	C	7/27/05	7/26/05
1.3.5.6.4.3	Observe First Cooling (Milestone)	C	9/7/05	10/5/05
1.4.7.1.3	Review Tevatron Alignment Plans 2005 (Milestone)	C	10/3/05	8/1/05
1.1.3.3.5	MI 2.5 MHz Acceleration complete	B	11/3/05	1/31/05
1.3.5.13	Electron Cooling Operational (start to contrib to HEP)	C	1/2/06	1/2/06
1.5.5	Start Summer 05 Shutdown	C	2/6/06	8/8/05
1.2.2.11	Intermediate AP2&DB Improvements Complete (Milestone)	A	4/18/06	10/3/05
1.3.6.8	Rapid Transfers Operational (Milestone)	A	4/18/06	10/31/05
1.5.6	Finish Summer 05 Shutdown	C	4/18/06	10/3/05
1.6.5.5	Start Phase 3 (Milestone)	A	4/18/06	1/2/06
1.3.3.1.2.4	Stacktail Reconfigured (option) (Milestone)	C	4/25/06	1/9/06



◇ Baseline Finish Date

◆ Actual Finish Date

○ Forecast Date

Progress as of September 30, 2005

% Complete

WBS	Name	Actual %	Planned %	A/P %
0	**Run II Upgrades**	**74%**	**82%**	**91%**
1	**Luminosity Upgrades**	**76%**	**83%**	**90%**
1.1	Protons on Pbar Target	64%	71%	91%
1.2	Pbar Acceptance	61%	75%	82%
1.3	Pbar Stacking & Cooling	84%	93%	91%
1.4	Tevatron High Luminosity	77%	84%	92%
1.5	Shutdowns	50%	50%	100%
2	**Maintenance & Reliability**	**65%**	**70%**	**92%**
2.1	2003 White Paper/Vulnerability Report	60%	59%	102%
2.2	Maintenance Improvements	71%	85%	83%
2.3	Project Management Oversight	66%	66%	100%

A/P % Complete: 93% last month
Shutdown delay ← Primary cause for further lag this month

M&S Spending through FY05

M&S Spending through September 2005		Plan estimate (Apr 05)				Inception		
		(then yr$)		FY05	FY05	to date (ITD)	ITD Obl+RIP	FY05 Obl+RIP
		FY05	Total	Allocation	Obl+RIP	Obl+RIP	/Total Est	/FY05 Allocation
Run II Upgrades		**5,196**	**17,791**	**6,536**	**4,282**	**14,445**	**81%**	**66%**
1	**Luminosity Upgrades**	**3,819**	**13,528**	**4,412**	**2,810**	**11,126**	**82%**	**64%**
1.1	**Protons on Target**	**537**	**1,607**	**629**	**290**	**1,321**	**82%**	**46%**
1.1.1	Slip Stacking	10	417	10	32	406	98%	317%
1.1.2	Pbar Target and Sweeping	11	54	0	-3	12	22%	
1.1.3	MI Upgrades	447	963	550	93	597	62%	17%
1.1.4	Booster-MI Cogging	0	0	0	0	0		
1.1.5	OTR	69	174	69	118	255	147%	171%
1.2	**pbar Acceptance**	**486**	**1,444**	**342**	**409**	**854**	**59%**	**119%**
1.2.1	LiLens	99	517	102	176	298	58%	173%
1.2.2	AP2 and DB Acceptance	387	928	240	233	556	60%	97%
1.3	**pbar Stacking and Cooling**	**1,413**	**5,072**	**1,173**	**1,123**	**4,215**	**83%**	**96%**
1.3.1	S&C Task Force	0	0	0	0	0		
1.3.2	Debuncher Cooling	0	0	0	0	0		
1.3.3	Stacktail Upgrade	102	1,507	105	184	876	58%	175%
1.3.4	Recycler Commissioning	227	469	228	88	295	63%	39%
1.3.5	Electron Cooling	776	2,536	522	681	2,562	101%	130%
	AIP	384	1,777	126	300	1,865	105%	238%
	Non AIP	392	759	396	381	697	92%	96%
1.3.6	Rapid Transfers	307	560	318	170	482	86%	53%
1.4	**Tevatron High Luminosity**	**1,277**	**5,207**	**1,205**	**989**	**4,635**	**89%**	**82%**
1.4.1	Beam Studies and Simulation	0	38	0	0	41	106%	
1.4.2	Active BBC	360	1,414	360	431	909	64%	120%
1.4.3	Increased Helix Separation	393	1,039	221	212	1,017	98%	96%
1.4.4	Luminosity Leveling	0	0	0	0	0		
1.4.5	Improved Controls and Diagnostics	278	2,174	358	256	2,173	100%	71%
1.4.6	Tevatron Vacuum Improvements	55	235	80	35	228	97%	43%
1.4.7	Tevatron Alignment	191	307	186	56	267	87%	30%
1.6	**Management**	**106**	**198**	**1,063**	**0**	**102**	**52%**	**0%**
2	**Reliability Upgrades**	**1,377**	**4,262**	**2,124**	**1,472**	**3,319**	**78%**	**69%**
2.1	Vulnerability White Paper	702	2,599	1,306	1,225	2,051	79%	94%
2.2	Reliability Upgrades	675	1,663	818	247	1,268	76%	30%

Effort for September 2005

Adjusted FTE September 2005		Division					Plan
		AD	TD	PPD	CD	Totals	3 MO rolling ave.
Run II Upgrades		**49.5**	**6.4**	**9.9**	**6.5**	**72.4**	**80.7**
1	**Luminosity Upgrades**	**48.5**	**3.4**	**3.4**	**6.5**	**61.9**	**69.8**
1.1	**Protons on Target**	4.2	0.0	1.1	5.1	10.4	**10.5**
1.2	**pbar Acceptance**	6.4	2.1	0.0	0.0	8.5	**7.0**
1.3	**pbar Stacking and Cooling**	23.7	0.0	0.0	0.0	23.7	**25.7**
1.4	**Tevatron High Luminosity**	12.4	1.3	2.3	1.4	17.4	**22.7**
1.6	**Management**	1.8	0.0	0.0	0.0	1.8	**3.9**
2	**Reliability Upgrades**	**1.0**	**3.0**	**6.6**	**0.0**	**10.5**	**10.9**

Shutdown delay taken into account

Current Change Requests (M&S)

- Thyratron replacement prototype $65K
- MI BPM $100K
- Drop 7835 development facility -$100K
- BLM prototype iteration 2 $10K
- Operational improvements for protons on target (Booster, Main Injector) $316K

Total : $391K

Contingency Analysis

- Estimate to complete: $18,665K - $14,445K = $4,220K
- Contingency remaining: $20,946K - $18,665K = $2,281K

  (Of this $550K has been borrowed for cryomodule clean room)

- Contingency Need estimate
  - MI BPM $200K
  - Rapid Transfers $100K
  - Recycler $200K
  - E-cool $100K
  - Stacktail $300K
  - Other $200K

  Major Concerns/New scope?
  - Pbar Stack rate related $200K

  ➔ $1.3 M

➢ Serious Vulnerability → Linac 7835 tubes
  - Test station for candidate tubes ~ $2 M

Change Requests (Nov. '05)

- E-cool upgrades $100K
- Tev upgrades visitors/travel $30K
- Target upgrades $20K
- Ramp corrector PS @F23 $20K
- Tev Separator
  vacuum shells $210K

- Total: 380K